

USER MANUAL

DHP-AX

Navigate through the control computer's menu using:



To increase or reduce the set values use: + or -

To adjust the room temperature: start by pressing +

The degree information that now appears in the display is the last desired room temperature.

To increase the temperature: press +

To lower the temperature: press -

The temperature you now require is registered immediately.

(After approximately ten seconds the desired room temperature appears in the display again, together with other information.)

The heat pump now starts to work to reach the new temperature.

Want to know more? Read the User manual!

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These instructions are valid for the following model of Danfoss heat pump:
DHP-AX

If these instructions are not followed during installation, operation and maintenance, Danfoss AS's liability according to the applicable warranty is not binding.

Danfoss AS retains the right to make changes to components and specifications without prior notice.

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1 Important information



If the installation is not used during the winter, the heating system must be drained of water, otherwise there is a risk of frost damage to the installation. (Contact an authorized installer, see the "13 References" section)

- The installation can be considered maintenance free but certain checks are necessary (see "8 Regular checks").
- Before changing the control computer's settings, first find out what these changes mean.
- Contact your installer for any service work.



This apparatus is not intended for persons (including children) with reduced physical, sensory or psychological capacity, or who do not have knowledge or experience, unless supervised or they have received instructions on how the apparatus functions from a safety qualified person.



Children are not permitted to play with the apparatus.

1.1 Safety precautions

1.1.1 Installation and maintenance



Only authorized installers may install, operate and carry out maintenance and repair work on the heat pump. (See the "13 References" section)



Only authorized electricians may modify the electrical installation. (See the "13 References" section)



FATAL DANGER! Only authorized refrigeration technicians may work on the refrigerant circuit. (See the "13 References" section.)

1.1.2 System modifications

Only authorized installers may carry out modifications on the following components:

- The heat pump unit

- The lines for refrigerant, water and power
- The safety valve

You must not carry out construction installations that may affect the operational safety of the heat pump.

1.1.3 Safety valve

The following safety precautions apply to the hot water circuit's safety valve with corresponding overflow pipe:



Never block the connection to the safety valve's overflow pipe.



Water expands when it is heated, this means that a small amount of water is released from the system via the overflow pipe. The water that exits the overflow pipe can be hot! Therefore, allow it to flow to a floor drain where there is no risk of burning yourself.

1.2 Protection

1.2.1 Corrosion Protection

Due to the risk of corrosion, avoid using different types of sprays in the vicinity of the heat pump. This particularly applies to:

- Solvents
- Chlorinated cleaning agents
- Paints
- Adhesives

2 About your heat pump

2.1 Principles of function

A heat pump utilises the free energy from the sun and that is found in a natural heat source, such as rock, ground, ground water or air. The heat pump can be compared to a reversed refrigerator; in a refrigerator heat is transferred from the inside of the refrigerator to the outside, whereas in a heat pump, the stored solar energy that is stored in a heat source is transferred to the inside of the house. The heat pump uses the solar energy in the heat source and gives back two to three times more heat energy than it uses in electrical energy. The heat pump is, therefore, a very environmentally friendly and economical way of heating a house.

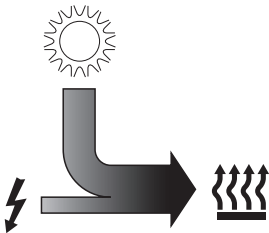
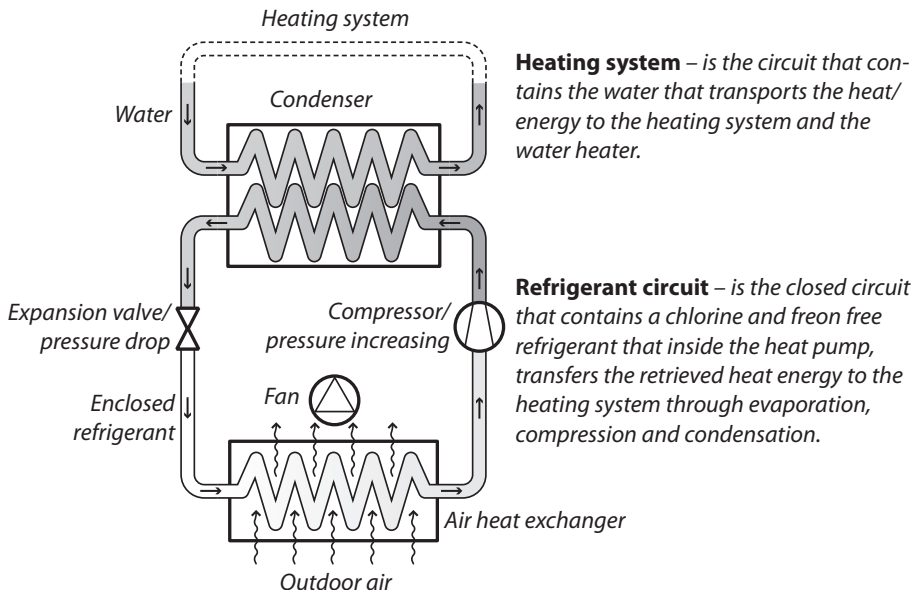


Figure 1: The relationship between consumed electrical energy and free solar energy.

In order for the heat pump to be able to retrieve heating energy from the outdoor air and transfer it to the heating system of the house, two separate liquid circuits are required. The figure below shows the different circuits and how they work



Heating system – is the circuit that contains the water that transports the heat/energy to the heating system and the water heater.

Refrigerant circuit – is the closed circuit that contains a chlorine and freon free refrigerant that inside the heat pump, transfers the retrieved heat energy to the heating system through evaporation, compression and condensation.

together in the transfer of heating energy.

Figure 2: Function principles of a heat pump.

- A fan draws up the outdoor air through an air heat exchanger, which heats up the cold refrigerant, which evaporates into a gas. The energy produced during this process is retrieved from the passing outdoor air.
- The refrigerant that now supplies energy in the form of heat is transferred to the compressor, which both increases its temperature and pressure.
- The extremely hot refrigerant continues to the condenser. Here, the refrigerant is cooled and releases its heating energy to the heating system. The refrigerant's temperature drops and condenses to a liquid state.
- The heating system transports the heating energy out to the water heater or the heating system, which indirectly heats the house.
- The refrigerant is then transported through the expansion valve where the pressure and temperature drop and the process starts again.

2.2 Components

DHP-AX is a complete heat pump installation for heating. It can be supplemented with a water heater and auxiliary heater.

DHP-AX is equipped with a control system, which is controlled via a control panel.

Heat enters the house via a water borne heating system.

The heat pump unit consists of the following basic units:

1 Heat pump unit

- Compressor
- Condenser
- Four way valve

2 Fan

- One speed

3 Air heat exchanger

In addition to these units, there is control equipment (installed indoors), which controls the heat pump unit's component parts (compressor, circulation pumps, auxiliary heaters and exchange valve) and determines when to start and stop the pump as well as whether to produce heat for the house or hot water.

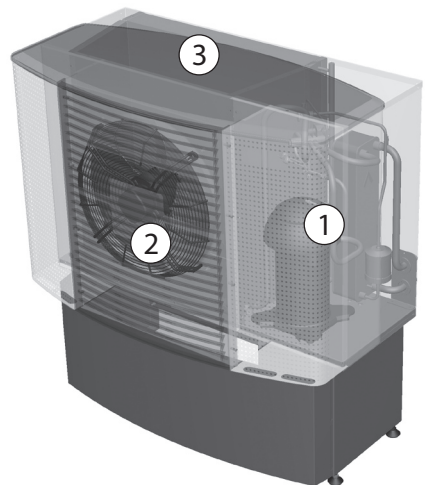


Figure 3: DHP-AX's main components.

2.3 Heating and defrost functions

2.3.1 Heating

DHP-AX is a heat pump that produces heating for houses and water heaters depending on the existing demand. Hot water production is continuous but during the summer heat production to the house is stopped when the outdoor temperature reaches the value for HEAT STOP.

During the winter, hot water and heat is produced for the house by the compressor until the outdoor temperature reaches the value for OUTDOOR STOP when it becomes too cold for the compressor to operate. If an auxiliary heater has been installed, it is used to produce hot water and heating for as long as OUTDOOR STOP applies.

DHP-AX defrosts the air heat exchanger automatically if required.

2.3.2 Defrost function

During operation the air heat exchanger is cooled by the energy exchange at the same time as the humidity causes it to become covered in frost. DHP-AX has an automatic function to defrost the air heat exchanger using the produced heat energy. If necessary, a defrosting sequence starts which means the following:

- The defrost sequence starts when the temperature of the incoming refrigerant is lower than the set value, which is based on a curve that is related to the outdoor temperature
- There are restrictions for the defrost regarding time in operation and FAN on
- The four way valve in the heat pump switches the direction of flow of the refrigerant and the fan stops, see figure below
- The hot refrigerant melts the frost on the air heat exchanger
- Defrost stops on time, operating pressostat or incoming temperature.
- The four way valve switches the direction of flow of the refrigerant back so that heat production resumes and operation returns to normal

The process is reversed by means of the four way valve that changes the direction of flow, which means that the air heat exchanger for heating becomes a condenser and the heating's condenser becomes an evaporator. This function is used for defrosting.

As the heat pump's defrosting sequence retrieves its energy from the house's heated heating system during the winter months, the water tank is primarily used as a heating buffer. If a water heater is not installed, the water volume in the heating system must be increased by installing a surge tank (accessory).

2.4 Auxiliary heat

Auxiliary heater is an option for DHP-AX and consists of an immersion heater, which is located on the supply pipe ahead of the exchange valve.

The auxiliary heater, which is supplied as an accessory has an integrated power control and is controlled by a potential free output from the heat pump. In the event of power cuts longer than three minutes, only a 6 kW output may be connected immediately after power has returned, the remaining output is delayed two hours.

If the auxiliary heater is installed it engages AUTO mode automatically when the heat demand is greater than the heat pump's capacity.

In the event of alarms that mean that the compressor does not start, hot water will not be produced in order to indicate to the customer that something is wrong. Heat is produced by the auxiliary heater so that the house does not become cold.

3 Regulation information

3.4.1 Heat production - calculating

The indoor temperature is adjusted by changing the heat pump's heat curve, which is the control system's tool for calculating what the supply temperature should be for water that is sent out in the heating system. The heat curve calculates the supply temperature depending on the outdoor temperature. The lower the outdoor temperature, the higher the supply temperature. In other words, the supply temperature of the water fed to the heating system will increase exponentially as the outside air temperature falls.

The heat curve will be adjusted in connection with installation. It must be adapted later on, however, to obtain a pleasant indoor temperature in any weather conditions. A correctly set heat curve reduces maintenance and saves energy.

3.4.2 CURVE

The control computer shows the value for CURVE by means of a graph in the character window. You can set the heat curve by adjusting the CURVE value. The CURVE value indicates the supply temperature of the water to be sent out to the heating system at an outdoor temperature of 0°C.

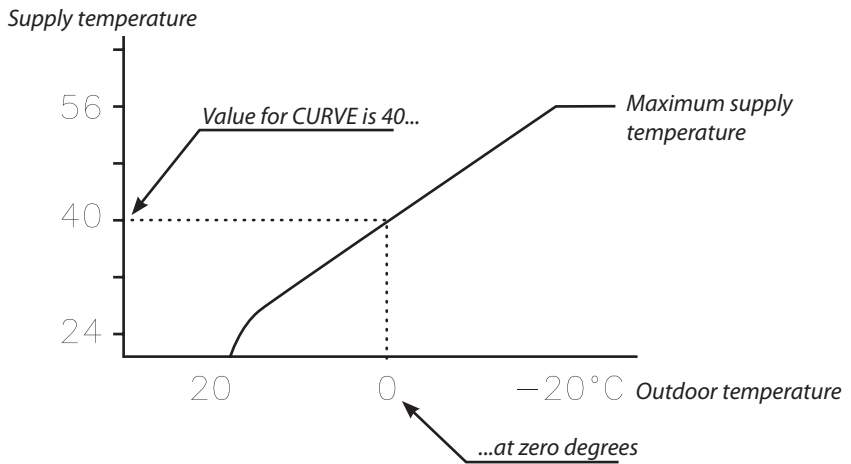


Figure 4: Graph showing the set value 40 for CURVE.

At outdoor temperatures colder than 0°C, supply water hotter than 40°C is sent out to the heating system and at outdoor temperatures greater than 0°C, supply water cooler than 40°C is sent out.

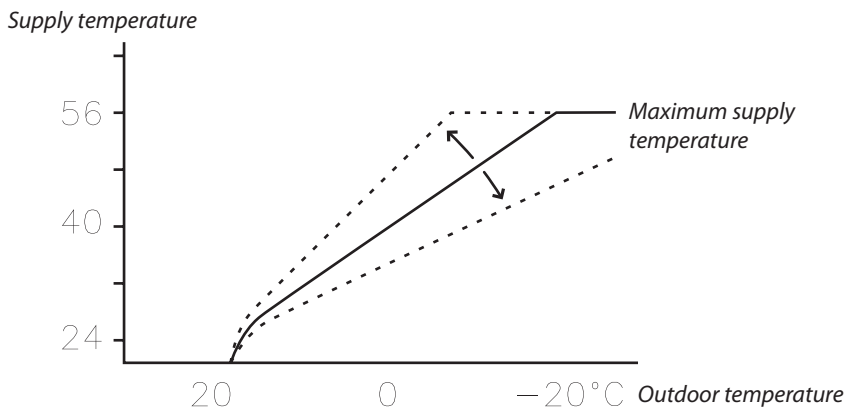


Figure 5: Increasing or reducing the CURVE changes the slope of the curve

If you increase the CURVE value, the heat curve will become steeper and when you reduce it, it will become flatter.

The most energy efficient and cost effective setting is achieved by changing the CURVE value to adjust the temperature in the house to an even and constant temperature. For a temporary increase or reduction, adjust the ROOM value instead.

3.4.3 ROOM

If you wish to increase or reduce the indoor temperature, change the ROOM value. The difference between changing the ROOM value and the CURVE value is that the system's heat curve does not become steeper or flatter if the ROOM value is changed, which the curve becomes if the CURVE value changes, instead the entire heat curve is moved by 3°C for every degree change of the ROOM value. The reason that the curve is adjusted 3°C is that an approximate 3°C increase in supply temperature is usually needed to increase the indoor temperature 1°C.

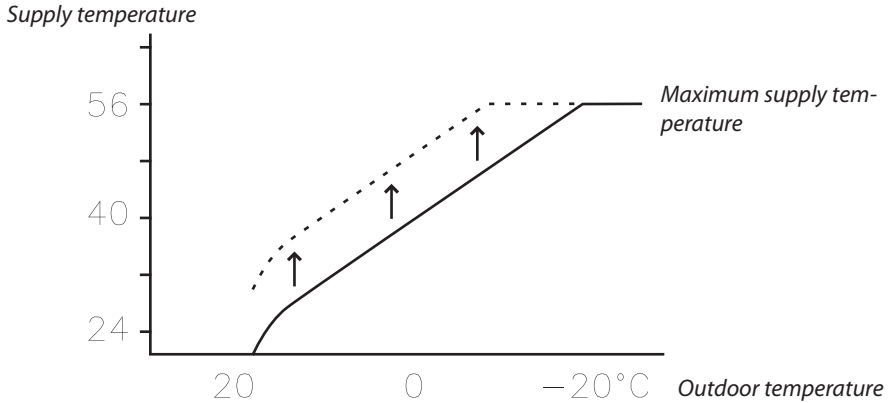


Figure 6: Changing the ROOM value changes the heat curve upwards or downwards.

The relationship of the supply temperature to outdoor temperature will not be affected. The supply temperature will be increased or reduced by the same number of degrees all along the heat curve. I.E. the entire heat curve rises or drops instead of the curve gradient changing.

This method of adjusting the indoor temperatures can be used for a temporary raise or drop. For long term increases or reductions of the indoor temperature, the heat curve is adjusted instead.

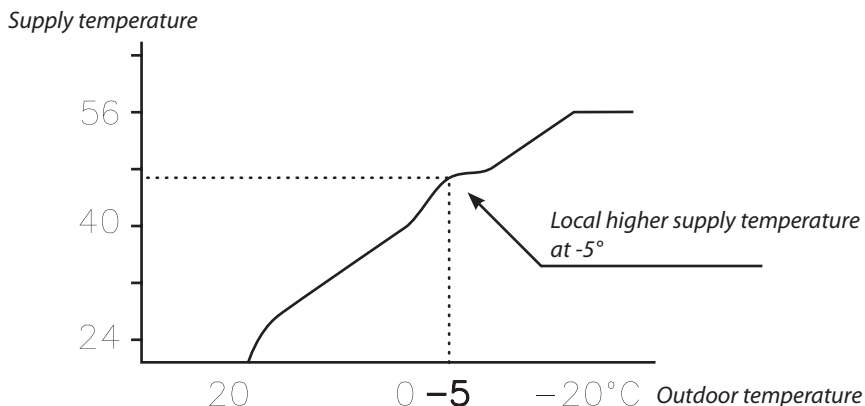


Figure 7: The adjusted curve at -5°C

Sometimes, at outdoor temperatures between -5°C and +5°C, part of the heat curve may need adjusting if the indoor temperature is not constant. For this reason, the control system includes a function adjusting the curve at three outdoor temperatures: -5°C, 0°C and +5°C. This function will allow you to increase or reduce the set-point value for the supply line temperature, without affecting the rest of the heat curve, at three specific outdoor temperatures. If, for example, the outdoor temperature is -5°C, the supply temperature will change gradually between 0°C and -10°C, maximum adjustment being reached at -5°C. The figure above shows the adjusted CURVE -5. The adjustment can be seen in the graph in the form of a bump.

You can choose to adjust the heat curve individually at three specified outdoor temperatures: -5°C, 0°C and +5°C. The supply temperature can be changed by plus/minus 5 degrees.

3.4.4 HEAT STOP

The HEAT STOP function automatically stops all production of radiator heat when the outdoor temperature is equal to, or higher than, the value entered for heat stop. When the heat stop function is activated, the circulation pump will be turned off - except when hot water is being produced. The circulation pump will be "exercised" for 1 minute per day. The factory set value for activating heat stop is an outdoor temperature of 17°C. If the heat stop function is active, the outdoor temperature must drop 3°C when setting, before the heat stop stops.

3.4.5 MIN and MAX

The MIN and MAX values are the lowest, respectively highest **set point values** that are allowed for the supply temperature.

Adjusting the minimum and maximum **setpoint values** for the temperatures is particularly important if your home has under floor heating.

If your house has under floor heating and parquet floors, the supply temperature must not be too high. Otherwise there is a risk that the parquet floors might be

damaged. If you have under floor heating and stone floors, MIN should not be too low in order to achieve a comfortable floor temperature in the summer time when heating is not required. A possible solution to obtain optimum temperatures is to use a shunt group for under floor heating.

If your house has a basement, the MIN value should be adjusted to a suitable temperature for the basement in summer. A condition for maintaining the heat in the basement in the summer is that all radiators have thermostat valves that switch off the heat in the rest of the house. It is extremely important that the heating system and the radiator valves are trimmed correctly. As it is usually the end customers themselves who have to carry out trimming, remember to inform them how to carry it out correctly. Also remember that the value for HEAT STOP needs adjusting upwards for summer heating.

3.4.6 TEMPERATURES

The heat pump can display a graph showing the history of the various sensors' temperatures and you can see how they have changed over 60 measurement points in time. The time interval between the measurement points can be adjusted between one minute and one hour, factory setting is one minute.

History is available for all sensors, but only the set value is shown in the display for the room sensor. The integral value that may appear is the heating system's energy balance.

3.4.7 INTEGRAL

The heat demand in the house depends on the season and weather conditions and is not constant. The heat demand can be expressed as temperature difference over time and can be calculated giving an integral value as a result (heat demand). To calculate the integral value, the control system uses several parameters.

A heat deficit is needed to start the heat pump, and there are two integral values, A1 (default value = -60), which starts the compressor and A2, (default value = -600), which starts the auxiliary heater. During heat production, the deficit reduces and when the heat pump stops, the inertia in the system causes a surplus of heat.

The integral value is a measurement of the surface under the time axle and is expressed in degree minutes. The figure below shows the factory settings for the integral values that the heat pump has. When the integral value has reached the set value for INTEGRAL A1, the compressor starts and if the integral value does not drop but continues to rise, the auxiliary heater starts when the integral value has reached the set value for INTEGRAL A1+A2.

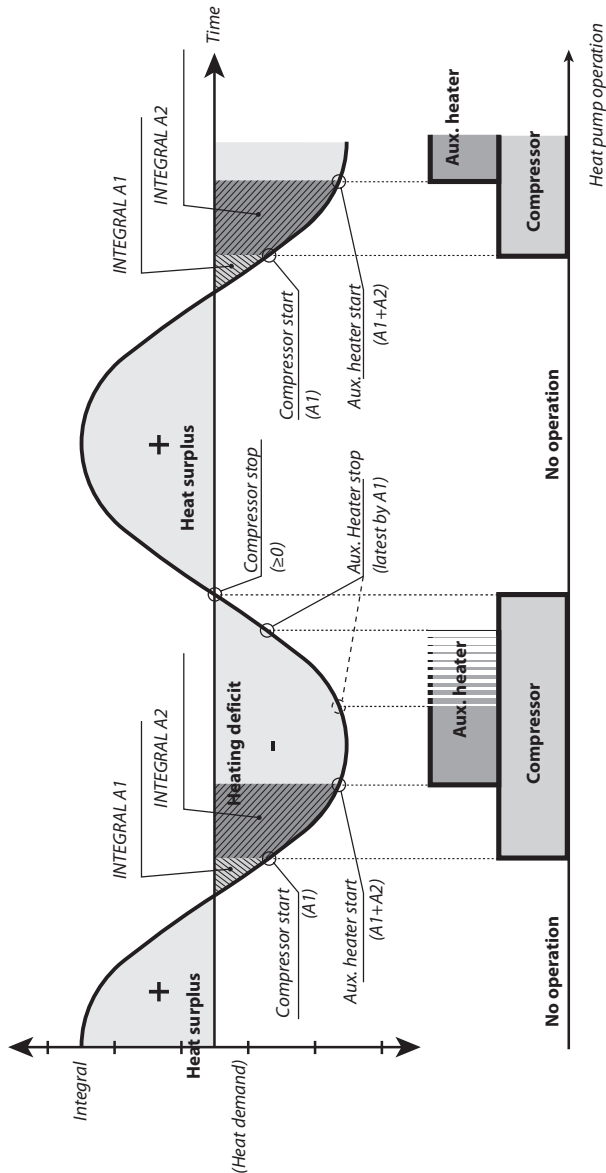


Figure 8: Starting and stopping heat pump operation based on integral values.

The integral value calculation stops during hot water production and during heat stop. Integral value calculation resumes two minutes after completed hot water production to give the heating system time to stabilise the temperature.

3.4.8 HYSTERESIS

In order to start the heat in advance during sudden changes of the heat demand, there is a value, HYSTERESIS, which controls the difference between the actual supply temperature, t_1 and the calculated supply temperature, t_2 . If the difference is the same or greater than the set HYSTERESIS value (x), i.e. there is a heat demand, or the heat demand disappears, quicker than the usual integral calculation, the integral value is forced to either the start value INTEGRAL A1 or to the stop value 0°min .

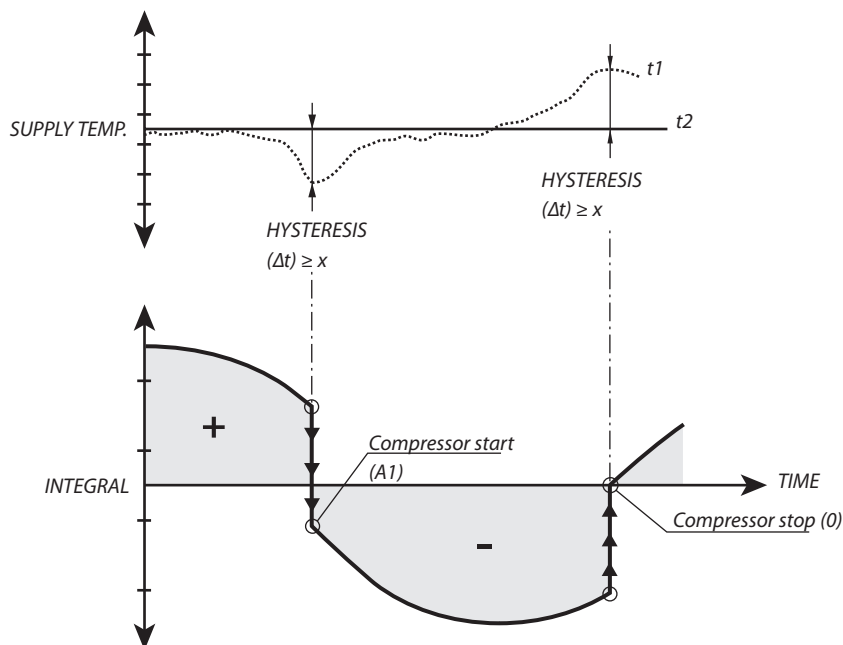


Figure 9: Conditions for HYSTERESIS to force the integral value to change.

3.4.9 DEFR CURVE

To start defrosting the outdoor unit, the control system makes a calculation using the temperature of the refrigerant return and the outdoor temperature.

What guides the calculation is a linear defrosting curve that can be set so that the heat pump and outdoor unit work optimally. The setting of three different values can be changed: DEFR CURVE 0, DEFR CURVE -20 and OUTDOOR STOP. The defrosting sequence starts when the temperature of the refrigerant return reaches the set parameter value at an outdoor temperature somewhere along the set defrosting curve.

The two parameters that are mainly changed are DEFR CURVE 0 and DEFR CURVE -16. The numbers behind the DEFR CURVE display what outdoor temperature the setting is for, that is to say at 0°C for DEFR CURVE 0 and -16 for DEFR CURVE -16. The

value -16 for DEFR CURVE -16 is the set value for OUTDOOR STOP, so if the value for OUTDOOR STOP changes, the numbers behind DEFR CURVE also change.

Factory setting for OUTDOOR STOP is -16°C. At this outdoor temperature, compressor operation is stopped and the addition takes over. It is seldom that the value of OUTDOOR STOP needs to be changed, tests and operating cases have shown that -16°C operates very well as the stop temperature. In the text and figures below the value -16°C has been used for OUTDOOR STOP.

The display shows the value for DEFR CURVE 0 and DEFR CURVE -20 by means of a graph in the character window.

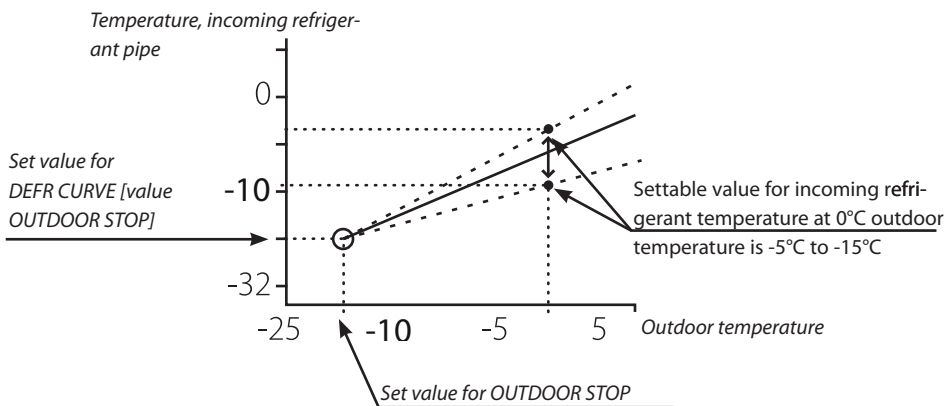


Figure 10: Graph that shows how the value for DEFR CURVE 0 can be set.

The value for OUTDOOR STOP that is set means that the compressor will no longer be used for heating or hot water production if the outdoor temperature is the same as or lower than the value. Heating and hot water production then occurs with the help of the auxiliary heater.

The value for DEFR CURVE 0 is the temperature that the refrigerant return is permitted to reach when a defrost must start at outdoor temperature 0°C.

In the corresponding way the value for DEFR CURVE -16 is the temperature that the refrigerant return has when a defrost should start at the set outdoor temperature for OUTDOOR STOP. The setting for DEFR CURVE -20 means that the value OUTDOOR STOP (-16°C) is reduced by between 1 and 5 degrees. This also determines how much lower the temperature for the refrigerant return may be than -16°C in this case.

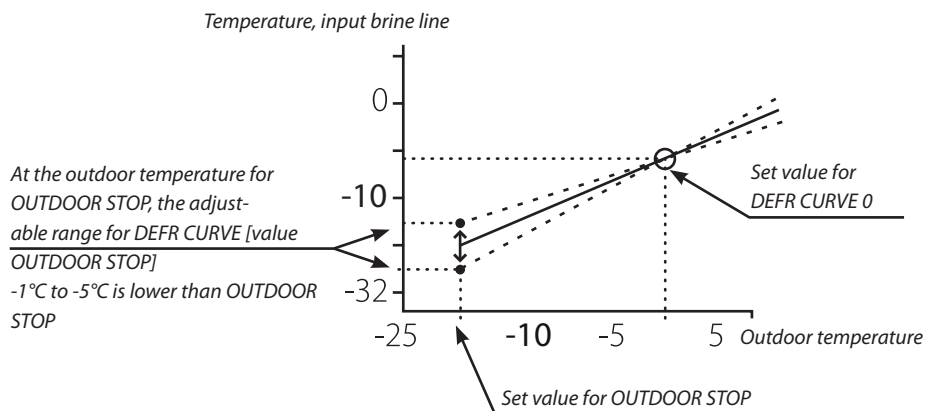


Figure 11: Graph that shows how the value for DEFR CURVE -16 can be set.

These three settings together create the defrosting curve and all three values have an effect on when defrosting will start, even if it is mainly DEFR CURVE 0 and DEFR CURVE -16 that is changed.

4 Control panel

The heat pump has an integrated control system that is used to automatically calculate the heat demand in the house where the heat pump is installed and to ensure that the correct amount of heat is produced and emitted where necessary. There are many different values (parameters) that must be referred to during the calculation of the heat demand.

During installation and service, the control panel is used to set and change values that have to be adapted according to the house demand. The control panel is integrated into the front of the heat pump and consists of a display, a keypad and an indicator. In the display, a simple menu system is used to navigate the desired settings and values. During operation, the display always shows the set ROOM value, the operating mode and the status of the heat pump.

The control system is controlled using a user-friendly menu system, which is shown in the display. Use the keypad's four navigation symbols to navigate the menus and increase or reduce the set values:

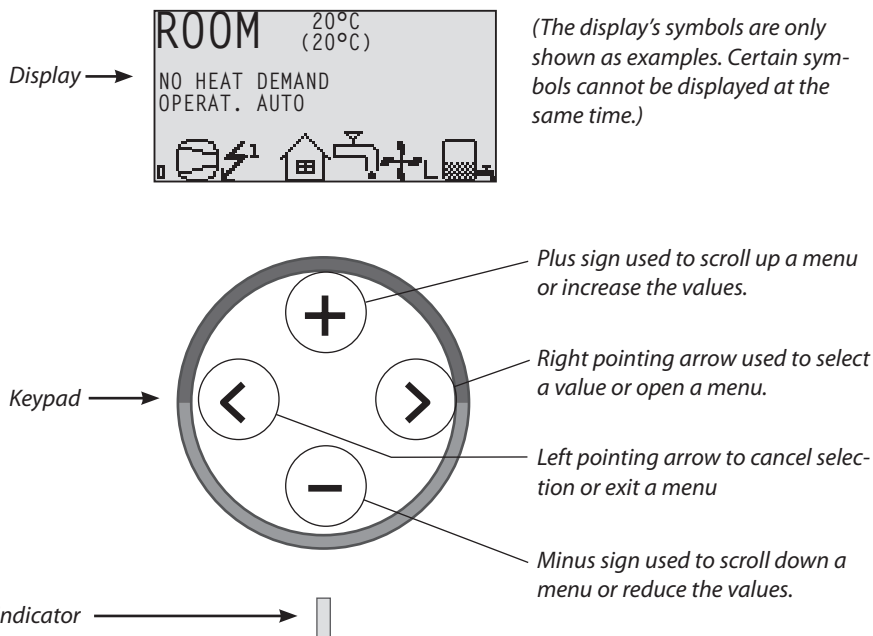


Figure 12: Display, keypad and indicator.

The menu, INFORMATION, is opened by pressing the left or right buttons. The INFORMATION menu has a number of sub menus that are described in section "5 Menu information".



The display always shows the set ROOM value and the status of the heat pump.

4.1 Display

The display of the control computer shows information about the heat pump's operation, status and any alarms, in text form. The status, indicated by symbols, is also shown in the lower section which shows the heat pump's active process.




4.1.1 Operating modes







Appear with applicable heat pump operating status text.

Operating mode	Meaning
 (OFF)	<p>The installation is fully switched off.</p> <div><p>Remember that if the operating mode OFF is to be used for long periods during the winter, the water in the heating system in the installation must be drained, otherwise there is a risk of frost damage.</p></div>
AUTO	Automatic operation with both heat pump and auxiliary heater permitted. If no auxiliary heating is permitted only AUTO or OFF can be selected as operating mode.
HEAT PUMP	The control computer is controlled so that only the heat pump unit (compressor) is allowed to operate. NOTE! No peak heating charging (anti-legionella function) with only heat pump operation.
AUX. HEATER	The control computer only permits the auxiliary heater to be in operation.
HOT WATER	The control computer permits operation with heat pump for hot water production and auxiliary heater during peak heat charging (anti-legionella function). No heating goes to heating system.

4.1.2 Symbols

Displays the operating status of the heat pump using symbols.

Symbol	Meaning
 HP	Indicates that the compressor is in operation. An "F" next to the symbol indicates that a flow switch is installed.
 LIGHTNING	Indicates that the auxiliary heater is in operation.
 HOUSE	Indicates that the 3-way valve position is for heat production for the house.

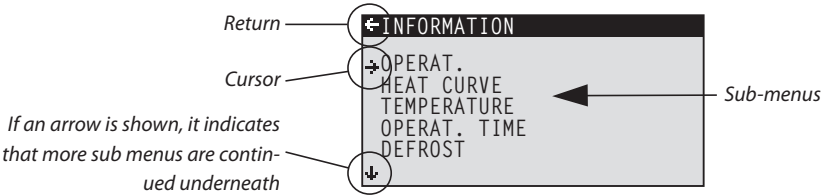
Symbol		Meaning
	TAP	Indicates that the 3-way valve's position is for hot water production.
	CLOCK	Indicates that tariff control is active.
	TANK	Indicates the temperature level in the water heater. During charging, the tank is filled and filling starts at the set start temperature. A lightning symbol by the symbol indicates peak heating charging (anti-legionella function).
	SQUARE	Either indicates that the operating pressure switch has deployed, or that the hot gas temperature has reached its maximum temperature.
	DEFROST	Displayed if defrosting is active.
	FAN	Displayed if the fan is active.

4.1.3 Text

Appears with applicable heat pump operating status text.

Message	Meaning
ROOM --°C	Shows the set ROOM value. Factory setting: 20°C. If the accessory room sensor is installed it first shows the actual temperature and then the desired indoor temperature within brackets.
ERR PHASE SEQ.	Alarm that indicates that there is an incorrect phase sequence to the compressor. Only display and only the first 10 minutes.
HIGH RETURN	Indicates that the high return temperature prevents the compressor's operation.
START	Indicates that there is a demand for heating production and that no start delay is active.
EVU STOP	Indicates that the additional function EVU is active. This means that the heat pump compressor and addition are off as long as EVU is active.
NO HEAT DEMAND	Indicates that there is no heating production demand.
HIGH PRESSURE ERROR	Alarm that indicates that the high pressure switch has deployed.

Message	Meaning
LOW PRESSURE ERROR	Alarm that indicates that the low pressure switch has deployed.
MOTOR P ERROR	Alarm that indicates that the motor protection has deployed.
SENSOR	Alarm that indicates a faulty sensor.
HEAT PUMP START	Indicates that the compressor will start within 30 seconds. The brine pump has started.
HEAT PUMP+AUX. HEATER	Indicates that heat production is active with both compressor and auxiliary heater.
AUX. HEATER	Indicates that there is an auxiliary heater demand.



Message	Meaning
DEFROST	Indicates the temperature for defrost.
RAD FLOW LOW	Indicates that the flow in the heating system is low.

5 Menu information

5.1 INFORMATION menu

The control computer’s menu, INFORMATION, is opened by pressing the right or left button once.

Figure 13: The INFORMATION menu for DHP-AX models with its sub menus.

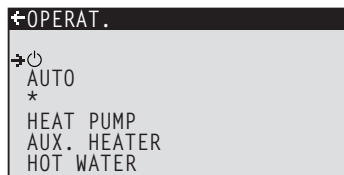
Use the up and down buttons to select the desired sub-menu and open the menu by pressing the right button once. To go back to the display’s starting point, press the left button once.


5.1.1 Sub-menu OPERAT.

In the OPERAT. menu you can set the operating mode of the heat pump.

When changing operating mode, confirm your choice by pressing the right button once. The asterisk moves to the selected operating mode.

For further information, see section "7.1 Setting operating mode".



Menu text	Description	Adjusted by:
⏻ (OFF)	<p>The installation is fully switched off. Any active alarms reset.</p> <div>  <p>Remember that if the operating mode OFF is to be used for long periods during the winter, the water in the heating system in the installation must be drained, otherwise there is a risk of frost damage.</p> </div>	By the customer, if necessary.
AUTO	Automatic operation with both heat pump and auxiliary heater permitted. If no auxiliary heating is permitted only AUTO or OFF can be selected as operating mode.	By the customer, if necessary.
HEAT PUMP	The control computer is controlled so that only the heat pump unit (compressor) is allowed to operate. NOTE! No peak heating charging (anti-legionella function) with only heat pump operation.	By the customer, if necessary.
AUX. HEATER	The control computer only permits the auxiliary heater to be in operation.	By the customer, if necessary.
HOT WATER	The control computer permits operation with heat pump for hot water production and auxiliary heater during peak heat charging (anti-legionella function). No heating goes to heating system.	By the customer, if necessary.

5.1.2 Sub-menu HEAT CURVE

In the HEAT CURVE menu the settings that affect the indoor temperature are made. For further information, see section "2 About your heat pump".

+HEAT CURVE	
CURVE	40°C
MIN	22°C
MAX	70°C
CURVE 5	0°C
CURVE 0	0°C
CURVE -5	0°C
↓HEAT STOP	17°C

Menu text	Description	Adjusted by:
CURVE	The set value indicates the supply line temperature of the water that is transported to the heating system at an outdoor temperature of 0°C.	By the customer, if necessary.
MIN	Sets the lowest permitted supply temperature.	By the customer, if necessary.
MAX	Sets the highest permitted supply temperature.	By the customer, if necessary.
CURVE 5	Used to adjust the heat curve at an outdoor temperature of +5°C.	By the customer, if necessary.
CURVE 0	Used to adjust the heat curve at an outdoor temperature of 0°C.	By the customer, if necessary.
CURVE - 5	Used to adjust the heat curve at an outdoor temperature of -5°C.	By the customer, if necessary.
HEAT STOP	This function stops all production of heat when the outdoor temperature is equal to, or higher than, the set heat stop value.	By the customer, if necessary.
REDUCTION	The temperature can be lowered using an outside timer. The control computer lowers the indoor temperature using the set value.	By the customer, if necessary.
ROOM FACTOR (Only displayed if a Room sensor is installed.)	Determines how large an impact the room temperature is to have when calculating the supply temperature. For underfloor heating we recommend a setting between 1-3 and for radiator heating between 2-4.	Factory setting: 2 (interval: 0 - 4) (0 = no impact, 4 = large impact)
POOL (Only displayed if an Expansion card is installed)	The temperature in the pool is controlled by a separate sensor regardless of the heating and hot water system.	By the customer, if necessary.

Menu text	Description	Adjusted by:
POOL HYSTERESIS (Only displayed if an Expansion card is installed)	The temperature range between start and stop for the pool's heat production.	Authorized installer. Adjusted for each installation.

5.1.3 Sub menu HEAT CURVE 2

The menu only applies if the expansion card is installed and only appears if shunt group sensor is connected and activated. Used to change settings for heat curve 2.

HEAT CURVE 2	
CURVE 2	40°C
MIN	10°C
MAX	55°C

Menu text	Description	Adjusted by:
CURVE 2	Calculated shunt group temperature at 0°C outdoor temperature. Shown as a graph that also shows MIN and MAX values.	By the customer, if necessary.
MIN	Minimum permitted shunt group temperature, if the temperature for heat stop has not been reached.	Authorized installer. Adjusted for each installation.
MAX	Maximum permitted shunt group temperature.	Authorized installer. Adjusted for each installation.

5.1.4 Sub-menu TEMPERATURE

In the TEMPERATURE menu you are able to view the various temperatures that the installation has had. All temperatures are stored 60 minutes (factory setting) back in time so that they can also be displayed in the form of graphs.

+TEMPERATURE	
OUTD	0°C
ROOM	20°C
SUPPLY LINE	38(40)°C
RETURN LINE	34(48)°C
HOT WATER	52°C
INTEGRAL	-660
↓REFR 1	-7°C

Menu text	Description	Adjusted by:
OUTD	Shows the actual outdoor temperature.	
ROOM	If ROOM shows 20°C the heat curve is unaffected. If ROOM shows higher or lower, this indicates that the heat curve has been adjusted up or down to change the indoor temperature.	By the customer, if necessary.
SUPPLY LINE	Shows the actual supply temperature. (The desired value is shown between brackets.) Read section "3 Regulation information" for more information. (In operating mode AUX. HEATER the stop temperature for hot water production is shown in brackets, increased by 5°.)	Not adjustable (The computer calculates the temperature required to maintain the indoor temperature.)
RETURN LINE	Shows the read return temperature. (The highest permitted temperature is shown between brackets.)	Authorized installer. Adjusted for each installation.
HOT WATER	Shows the actual hot water temperature.	Not adjustable
INTEGRAL	Heat production is controlled by a calculated demand that is automatically calculated when the installation is in operation. The calculated value for integral displays the heating system's actual energy balance. Read section "3 Regulation information" for more information.	Not adjustable
REFR 1	Shows the actual temperature of the refrigerant.	Not adjustable

Menu text	Description	Adjusted by:
REFR 2	Shows the actual temperature of the refrigerant.	Not adjustable
POOL (Only displayed if an Expansion card is installed)	Shows the actual pool temperature. The set pool temperature is shown in brackets.	Not adjustable
SHUNT GROUP	Shows the actual supply temperature. The calculated supply temperature to the shunt group is within brackets.	Not adjustable
CURRENT (Only displayed if an Expansion card is installed)	Shows the actual current consumption. The set value for MAX CURRENT is shown between brackets.	Not adjustable

5.1.5 Sub-menu OPERAT. TIME

In the OPERAT. TIME menu you are able to view the operating time of the installation. Operating times cannot be reset but are accumulated during the service life of the heat pump. The control computer calculates the operating time in minutes but only complete hours are shown in the display.

← OPERAT. TIME	
HEAT PUMP	0H
AUX. HEAT 1	0H
HOT WATER	0H

Menu text	Description	Adjusted by:
HEAT PUMP	Shows the total time in hours that the heat pump has been in operation since installation. The number of operating hours includes the time for both heat production and hot water production.	Not adjustable
AUX. HEAT 1	Shows the total time in hours that the auxiliary heater has been in operation since installation.	Not adjustable
HOT WATER	Shows a part of the time that is included in the HEAT PUMP value. The number of hours that hot water production has been in operation since installation are shown here.	Not adjustable

5.1.6 Sub-menu DEFROST

In the “DEFROST” menu it is possible to view miscellaneous information about defrosting the outdoor unit and also possible to make adjustments.

+DEFROST	
DEFROSTS	05
BETW. 2 DEFR	0M
TIME LAST DEFR	0M
FAN H OFF AT	12°C
DEFROST CURVE	
MANUAL DEFR	0

Menu text	Description	Adjusted by:
DEFROSTS	Total number of defrosts carried out since installation, i.e. the number not reset.	Not adjustable
BETW. 2 DEFR	The operating time of the compressor in minutes between the 2 last defrosts.	Not adjustable
TIME LAST DEFR	The operating time of the compressor in minutes since last defrost. Reset after a defrost is completed.	Not adjustable
DEFROST CURVE	Here, the angle of the defrost curve can be changed using the right-hand arrow and by either pressing + or -. (Change the start temperature for when defrosting is to begin).	By the customer, if necessary.
MANUAL DEFR	By using the right-hand arrow and then pressing +, defrost can be started manually. During defrost, hot refrigerant circulates to the air heat exchanger.	By the customer, if necessary.

6 Trimming the heating system

To obtain a heating system balance and obtain an even and comfortable indoor temperature, you must adjust your heating system according to the example below.



Adjust the heating system during the winter to obtain the greatest possible output.



Trimming must be carried out over a few days as the inertia in the heating system causes the indoor temperature to change slowly.

- 1 Choose one of the house's rooms as a reference room for the indoor temperature, where the highest temperature is required, 20-21°C.
- 2 Place a thermometer in the room.
- 3 Open all the heating system's radiator valves fully.
- 4 Leave the heat pump's ROOM value set at 20°C. See section "7.2 Instructions – Setting the ROOM value" for further information.
- 5 Note the temperature in the reference room at different points in time over a 24 hour period.
- 6 Adjust the ROOM value so that the reference room reaches your required indoor temperature of 20-21°C. Remember that other rooms will have different temperatures during trimming, but these are adjusted later.
- 7 If the ROOM value must be adjusted more than 3°C upwards or downwards the CURVE value must be adjusted instead. See section "7.3 Instructions – Adjusting the CURVE value" for further information.
- 8 If the indoor temperature varies several degrees despite trimming, a specific part of the heat curve may need adjusting. Check at what outdoor temperature the variation is greatest and adjust the curve at the corresponding value (CURVE 5, CURVE 0, CURVE -5). See section "7.4 Instructions – Adjusting a specific part of the heat curve" for further information.
- 9 When the reference room has an even temperature of 20-21°C over a 24 hour period, you can adjust the radiator valves in the other rooms so that their indoor temperatures are the same temperature or lower than the reference room.

7 Instructions

An authorized installer carries out the basic settings of the heat pump at installation. You can carry out the following yourself:

- Setting operating mode
- Setting ROOM values
- Adjusting CURVE values
- Adjusting a specific part of the heat curve
- Setting the desired maximum and minimum supply temperature
- Setting HEAT STOP
- Reading off the hot water temperature or different temperatures in the heat pump
- Defrost the outdoor unit

7.1 Setting operating mode

In the control computer you can choose between five operating modes:

To change the operating mode:

- 1 Press either the right or left button once to open the INFORMATION menu. The cursor is in the OPERAT. menu option.
- 2 Open your selection by pressing the right button once. An asterisk indicates the current operating mode..
- 3 Mark the new desired operating mode using the up or down button.
- 4 Press the right button once to confirm your choice. The asterisk moves to your selected operating mode.
- 5 Press the left button twice to exit the menu.

7.2 Setting ROOM values

If the indoor temperature is too high or too low, you can adjust the ROOM value to change the indoor temperature.

To change the ROOM value:

- 1 Press either the up or the down button once to open and change the ROOM value.
- 2 Raise or reduce the ROOM value using the up or down buttons to change the indoor temperature.
- 3 Wait ten seconds or press the left button once to exit the menu.

7.3 Adjusting CURVE values

To change the CURVE value:

- 1 Press either the right or left button once to open the INFORMATION menu. The cursor is in the OPERAT. menu option.
- 2 Press the down button to move the cursor to the HEAT CURVE menu option.
- 3 Open the menu by pressing the right button once.. The cursor is at CURVE.
- 4 Open your selection by pressing the right button once.
- 5 Raise or reduce the value with the up or down buttons. The graph shows how the CURVE slope changes.
- 6 Press the left button three times to exit the menu.

7.4 Adjusting a specific part of the heat curve

To change a specified part of the heat curve:

- 1 Press either the right or left button once to open the INFORMATION menu. The cursor is in the OPERAT. menu option.
- 2 Press the down button to move the cursor to the HEAT CURVE menu option.
- 3 Open the menu by pressing the right button once. The cursor is at the CURVE value.
- 4 Select CURVE 5, CURVE 0 or CURVE -5 using the up or down buttons.
- 5 Open your selection by pressing the right button once.
- 6 Raise or reduce the value with the up or down buttons.
- 7 Press the left button three times to exit the menu.

7.5 Setting MIN and MAX values

To change MIN or MAX:

- 1 Press either the right or left button once to open the INFORMATION menu. The cursor is in the OPERAT. menu option.
- 2 Press the down button to move the cursor to the HEAT CURVE menu option.
- 3 Open the menu by pressing the right button once. The cursor is at the CURVE value.
- 4 Press the down button to move the cursor to MIN.
- 5 Open your selection by pressing the right button once. The text row MIN is marked.
- 6 Raise or reduce the value with the up or down buttons.
- 7 Press the left button three times to exit the menu.

Repeat the procedure to change the MAX value, but select MAX instead of MIN at step 4.

7.6 Setting HEAT STOP

To change HEAT STOP:

- 1 Press either the right or left button once to open the INFORMATION menu. The cursor is in the OPERAT. menu option.
- 2 Press the down button to move the cursor to the HEAT CURVE menu option.
- 3 Open the menu by pressing the right button once. The cursor is at the CURVE value.
- 4 Press the down button to move the cursor to HEAT STOP.
- 5 Open your selection by pressing the right button once. The text row HEAT STOP is marked.
- 6 Raise or reduce the value with the up or down buttons.
- 7 Press the left button three times to exit the menu.

7.7 Reading off temperatures

Reading off the hot water temperature (if a water heater is installed).

- 1 Press either the right or left button once to open the INFORMATION menu. The cursor is in the OPERAT. menu option.
- 2 Press the down button to move the cursor to the TEMPERATURE menu option.
- 3 Open your selection by pressing the right button once.
- 4 Press the down button to move the cursor to HOT WATER. The value shown at the HOT WATER menu option is the hot water's current value.
- 5 Open your selection by pressing the right button once. A graph of the hot water temperature over the last hour is shown.
- 6 Press the left button three times to exit the menu.

To view the TEMPERATURE history:

- 1 Press either the right or left button once to open the INFORMATION menu. The cursor is in the OPERAT. menu option.
- 2 Press the down button to move the cursor to the TEMPERATURE menu option.
- 3 Open the menu by pressing the right button once.
- 4 The cursor is at the OUTDOOR value.
- 5 Press the up or down button to move the cursor to the desired value.
- 6 Open your selection by pressing the right button once. A graph appears in the display.
- 7 Move the cursor along the time axis using the up (plus) or down (minus) buttons. An exact value at the relevant time is shown at the top of the display.
- 8 Press the left button three times to exit the menu.

7.8 Manual defrost

If DHP-AX requires defrosting you can run a defrosting procedure manually from the control computer.

To defrost manually:

- 1 Press either the right or left button once to open the INFORMATION menu. The cursor is in the OPERAT. menu option.
- 2 Press the down button to move the cursor to the DEFROST menu option.
- 3 Open the menu by pressing the right button once.
- 4 Press the down button to move the cursor to the MANUAL DEFR menu option.
- 5 Press the right button once.
- 6 Press the up button once to start defrost.
- 7 Press the left button three times to exit the menu.

8 Regular checks

8.1 Checking operation

During normal operation, the alarm indicator lights green continuously to show that everything is OK. When the alarm is triggered, it flashes green at the same time as a text message is shown in the display.

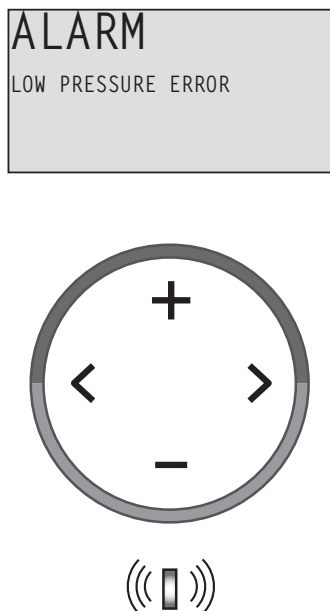


Figure 14: Flashing alarm indicator in the event of an alarm.

Regularly check the alarm indicator to ensure that the installation is working correctly. It is not always the case that you will notice a problem with the installation, for example, in the event of a fault with the compressor the auxiliary heater starts automatically (operating mode AUTO). For further information about alarms, see section "10 Troubleshooting".

8.2 Checking the water level in the heating system

The line pressure of the installation must be checked once a month. The external manometer must show a value between 1-1.5 bar. If the value is below 0.8 bar, when the water in the heating system is cold, the water must be topped up (applies in the event of an empty expansion tank).

You can use normal tap water when topping up the heating system. In certain exceptional cases the water quality may be so poor (for example very hard water) that it is not suitable for filling the heating system. If unsure, contact your installer, see section "13 References".



Do not use any additives for water treatment in the heating system's water!



The closed expansion tank contains an air filled bladder that absorbs variations in the heating system's volume. Under no circumstances may it be bled of air.

8.3 Checking the safety valve

The safety valves for the heating system must be checked at least four times a year to prevent lime deposits clogging the mechanism.

It is quite normal that the safety valve lets out small amounts of water when the water tank is being charged, especially if a lot of hot water was used previously.

The safety valve can be checked by turning the cap a quarter of a turn clockwise until the valve lets out some water through the overflow pipe. If the valve does not work properly, it must be replaced. Contact your installer, see section "13 References".

The opening pressure of the safety valve is not adjustable.

8.4 In the event of leakage

In the event of leakage in the hot water pipes between the heat pump and water taps, close the shut-off valve on the cold water inlet immediately. Then contact an authorized installer, see section "13 References".

8.5 Cleaning the strainer for the heating system



The heat pump must be switched off at the main switch before cleaning can be started.



The brine circuit's strainer must be cleaned twice a year after installation. The interval can be extended if there is evidence that cleaning twice a year is not necessary.

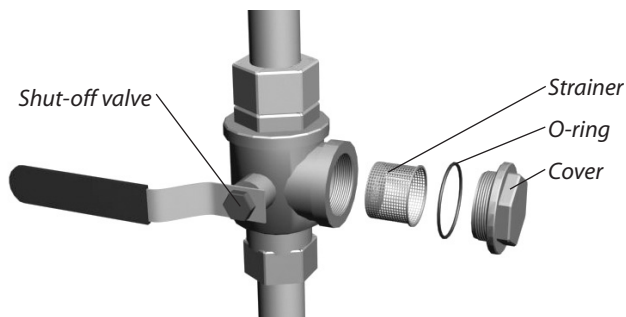


Figure 15: Shut-off cock and strainer on the return line.



NOTE! Have a cloth to hand when opening the strainer cover as a small amount of water usually escapes.

To clean the strainer:

- 1 Switch off the heat pump.
- 2 Turn the shut-off cock to the closed position (see figure above).
- 3 Unscrew the cover and remove it.
- 4 Remove the strainer.
- 5 Rinse the strainer.
- 6 Reinstall the strainer.
- 7 Check that the o-ring on the cover is not damaged.
- 8 Screw the cover back into place.
- 9 Turn the shut-off cock to the open position.
- 10 Start the heat pump.

9 Accessories

9.1 Room temperature sensor

Contact your installer if you wish to supplement your heat pump installation with a room temperature sensor, see section "13 References".

The room sensor is an accessory that is used to set a desired indoor temperature. It can be installed in the house where the room temperature is relatively constant, not in a hallway, kitchen or a room with alternative heating. On the room sensor you can set the desired room temperature and view the outdoor temperature.

The room temperature sensor has a temperature sensor that provides a further value that the control computer can use when calculating the supply temperature. The influence of the room sensor in the calculation can be set in the menu HEAT CURVE-> ROOM FACTOR. Default setting for ROOM FACTOR is 2 but can be adjusted from 0 (no impact) to 4 (large impact).

The difference between the desired and actual indoor temperature is multiplied by the set value for ROOM FACTOR. The set point on the heating system's supply line increases or decreases with the result depending on whether there is a deficit or surplus of heat. The table below shows examples of how the set point for the supply line is affected at CURVE 40 with different settings for ROOM FACTOR.

In the event of a heating deficit:

ROOM FACTOR	Increased room temperature, °C	Actual room temperature, °C	Set point for supply line, °C
0	22	20	40
1	22	20	42
2	22	20	44
3	22	20	46
4	22	20	48

In the event of a surplus of heat the conditions are the opposite:

ROOM FACTOR	Increased room temperature, °C	Actual room temperature, °C	Set point for supply line, °C
0	20	22	40
1	20	22	38
2	20	22	36
3	20	22	34
4	20	22	32

- The room sensor's display shows the actual indoor temperature in normal mode.
- To display the outdoor temperature press the up and down buttons at the same time.
- To set the desired indoor temperature press either the up or down button.
- If the heat pump has an active alarm the text AL appears in the display.

10 Troubleshooting

10.1 Alarm

In the event of an error message try restarting the installation using the installation's safety switch. If restarting the heat pump does not help try rectifying the problem using the table below. Contact your installer, see section "13 References", if you are unable to rectify the problem yourself.

Message	Meaning	Cause	Remedy
LOW PRESSURE ERROR	LOWPRESS ERROR - The compressor stops and there is no hot water production.	Not enough fluid in the brine system. Air in the brine system. Blocked filter in the brine system.	Contact your installer.
HIGH PRESSURE ERROR	HIGHPRESS ERROR - The compressor stops and there is no hot water production.	Insufficiently opened radiator/floor loop thermostats. Air in the heating system. Blocked strainer in the heating system.	Open radiator / floor loop thermostats. Top up and bleed the heating system or contact your installer.
MOTOR P ERROR	Motor protection cut out. The compressor stops and there is no hot water production.	Power failure caused by a blown fuse or the safety switch has deployed.	Check the fuses and reset the safety switch.
OUTDOOR SENSOR	Fault in outside sensor. To calculate the supply temperature's desired value, use 0°C instead.	Electrical fault.	Contact your installer.
SUPPLY LINE SENSOR	Supply line sensor error. Everything stops except the circulation pump for the heating system.	Electrical fault.	Contact your installer.

Message	Meaning	Cause	Remedy
RETURN LINE SENSOR	Return sensor fault.	Electrical fault.	Contact your installer.
HOT WATER SENSOR	Fault in the hot water sensor. No hot water production.	Electrical fault.	Contact your installer.
ALARM ROOM SENSOR	The actual room temperature is not displayed. To calculate the supply temperature's desired value, use 20°C instead.	Electrical fault.	Contact your installer.
ERR PHASE SEQ.	The compressor in the heat pump is operating in the wrong direction and this means that only the auxiliary heater is maintaining heating.	The phase sequence changed when changes were made in the electrical installation of the house.	Contact your installer.
HIGH RETURN	The temperature of the water that returns from the radiators is too high and prevents the heat pump from working	Insufficiently opened radiator/floor loop thermostats.	Ensure that all thermostat valves are fully open.

11 Terms and abbreviations

Term	Explanation
Evaporator	In the evaporator, energy is retrieved from the outdoor air and the refrigerant that passes through the air heat exchanger is heated and evaporates into a gas. (See section "2 About your heat pump" for further information).
Compressor	The compressor raises the temperature and pressure of the refrigerant. (See section "2 About your heat pump" for further information).
Condenser	In the condenser, the refrigerant supplies its heat energy to the heat transfer fluid circuit. (See section "2 About your heat pump" for further information).
CURVE	The CURVE value is set via the display. The set value indicates the supply line temperature of the water that is transported to the radiators at an outside temperature of 0°C.
Refrigerant circuit	Is the circuit in the heat pump that through evaporation, compression and condensation takes energy from the outdoor air and supplies it to the heat transfer fluid circuit. (See section "2 About your heat pump" for further information).
Refrigerant	Is the fluid/gas that transports heat from the air heat exchanger and supplies it to the heating system. (See section "2 About your heat pump" for further information).
Radiator	Heater element, element.
ROOM	If ROOM shows 20 °C the heat curve is unaffected. If ROOM shows higher or lower, this indicates that the heat curve has been adjusted up or down to change the indoor temperature.
Control system	The control computer controls the entire heating installation. All settings are stored and the history of the installation is registered here. The control computer's settings can be changed via the display.
Heat transfer fluid circuit	The fluid circuit obtains heat/energy from the refrigerant circuit, which it then transports to the water tank or heating system. See section "2 About your heat pump" for further information.
Heat curve	The control computer determines the correct temperature of the water to be distributed to the heating system based on the heat curve. The indoor temperature is adjusted by changing the gradient of the heating system's CURVE.

12 Default settings in the control computer

The first column in the table below shows the parameters that can be adjusted by the User. The second column shows settings made at the factory, and the third column the settings made by the installation contractor in connection with installation of the heat pump.

Make sure that the installation contractor enters any settings made during installation that are particular to your heat pump. This will make it easier for you when you make your own adjustments.

Setting	Factory setting	Any customer specific settings
ROOM	20°C	
OPERAT.	AUTO	
CURVE	40°C	
MIN	10°C	
MAX	55°C	
CURVE 5	0°C	
CURVE 0	0°C	
CURVE -5	0°C	
HEAT STOP	17°C	

13 References

13.1 Check list

Installed model:

- Setting up
- Surface adjustment
- Piping installation
- Leak test
- Bleeding
- Open radiator valves
- Function test safety valve
- Electrical Installation
- Direction of rotation of the compressor
- Outdoor sensor
- Accessories:
- Function test safety valve
- Control computer
- Basic settings
- Test operation
- Manual test carried out
- Noise check

Customer information:

- Control computer, menus, User manual
- Checking and filling, heating system
- Alarm information
- Function test safety valve
- Strainers, cleaning
- Trimming information
- Warranties

13.2 Installation carried out

PIPE INSTALLATION

Date

Company

Name

Tel. No.

ELECTRICAL INSTALLATION

Date

Company

Name

Tel. No.

